

PAID-UP
OIL & GAS LEASE1303082-017
Lease No.

03/10 - WV

This Lease, made this 12th day of July, 2010, by and between Brenda Smith, f/k/a Brenda Thomas, married and doing business in her sole and separate right, whose address is 2339 Willow Drive, SW, Warren, OH 44485 hereinafter collective called "Lessor." and CHESAPEAKE APPALACHIA, L.L.C., an Oklahoma limited liability company, P. O. Box 18496, Oklahoma City, Oklahoma 73154-0496, hereinafter called "Lessee."

WITNESSETH, that for and in consideration of Ten Dollars (\$10.00) and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, and of the mutual covenants and agreements hereinafter set forth, the Lessor and Lessee agree as follows:

LEASING CLAUSE. Lessor hereby leases exclusively to Lessee all the oil and gas (including, but not limited to coal seam gas, coalbed methane gas, coalbed gas, methane gas, gob gas, occluded methane/natural gas and all associated natural gas and other hydrocarbons and non-hydrocarbons contained in, associated with, emitting from, or produced/originating within any formation, gob area, mined-out area, coal seam, and all communicating zones), and their liquid gaseous constituents, whether hydrocarbon or non-hydrocarbon, underlying the land herein leased, together with such exclusive rights as may be necessary or convenient for Lessee, at its election, to explore for, develop, produce, measure, and market production from the Leasehold, and from adjoining lands, using methods and techniques which are not restricted to current technology, including the right to conduct geophysical and other exploratory tests; to drill, maintain, operate, cease to operate, plug, abandon, and remove wells; to use or install roads, electric power and telephone facilities, and to construct pipelines with appurtenant facilities, including data acquisition, compression and collection facilities for use in the production and transportation of products from the Leasehold or from neighboring lands across the Leasehold, to use oil, gas, and non-domestic water sources, free of cost, to store gas of any kind underground, regardless of the source thereof, including the injecting of gas therein and removing the same therefrom; to protect stored gas; to operate, maintain, repair, and remove material and equipment.

DESCRIPTION. The Leasehold is located in the District of Washington, in the County of Marshall, in the State of West Virginia, and described as follows:

Property Tax Parcel Identification Number: Tax Map 1, Parcels 22, 22.1, 22.2, 22.3

and is bounded formerly or currently as follows:

On the North by lands of Daniel Dobbs;

On the East by lands of Daniel Dobbs;

On the South by lands of Washington Map 1A

On the West by lands of Several Small Parcels;

including lands acquired from Ruby C. Walker by virtue of Intestate Descent as to be set forth in Affidavit of Heirship dated May 12, 2010, and NOT YET RECORDED, in Marshall County, WV and described for the purposes of this agreement as containing a total of 50.23 Leasehold acres, whether actually more or less, and including contiguous lands owned by Lessor. This Lease also covers and includes, in addition to that above described, all land, if any, contiguous or adjacent to or adjoining the land above described and (a) owned or claimed by Lessor, by limitation, prescription, possession, reversion or unrecorded instrument or (b) as to which Lessor has a preference right of acquisition. Lessor agrees to execute any supplemental instrument requested by Lessee for a more complete or accurate description of said land.

LEASE TERM. This Lease shall remain in force for a primary term of five (5) years from 12:00 A.M. July 12, 2010 (effective date) to 11:59 P.M. July 12, 2015 (last day of primary term) and shall continue beyond the primary term as to the entirety of the Leasehold if any of the following is satisfied: (i) operations are conducted on the Leasehold or lands pooled/unitized therewith in search of oil, gas, or their constituents, or (ii) a well deemed by Lessee to be capable of production is located on the Leasehold or lands pooled/unitized therewith, or (iii) oil or gas, or their constituents, are produced from the Leasehold or lands pooled/unitized therewith, or (iv) if the Leasehold or lands pooled/unitized therewith is used for the underground storage of gas, or for the protection of stored gas, or (v) if prescribed payments are made, or (vi) if Lessee's operations are delayed, postponed or interrupted as a result of any coal, stone or other mining or mining related operation under any existing and effective lease, permit or authorization covering such operations on the leased premises or on other lands affecting the leased premises, such delay will automatically extend the primary or secondary term of this oil and gas lease without additional compensation or performance by Lessee for a period of time equal to any such delay, postponement or interruption.

If there is any dispute concerning the extension of this Lease beyond the primary term by reason of any of the alternative mechanisms specified herein, the payment to the Lessor of the prescribed payments provided below shall be conclusive evidence that the Lease has been extended beyond the primary term.

EXTENSION OF PRIMARY TERM. Lessee has the option to extend the primary term of this Lease for one additional term of five (5) years from the expiration of the primary term of this Lease; said extension to be under the same terms and conditions as contained in this Lease. Lessee may exercise this option to extend this Lease if on or before the expiration date of the primary term of this Lease, Lessee pays or tenders to the Lessor or to the Lessor's credit an amount equal to the initial consideration given for the execution hereof. Exercise of this option is at Lessee's sole discretion and may be invoked by Lessee where no other alternative of the Lease Term clause extends this Lease beyond the primary term.

NO AUTOMATIC TERMINATION OR FORFEITURE.

(A) **CONSTRUCTION OF LEASE:** The language of this Lease (including, but not limited to, the Lease Term and Extension of Term clauses) shall never be read as language of special limitation. This Lease shall be construed against termination, forfeiture, cancellation or expiration and in favor of giving effect to the continuation of this Lease where the circumstances exist to maintain this Lease in effect under any of the alternative mechanisms set forth above. In connection therewith, (i) a well shall be deemed to be capable of production if it has the capacity to produce a profit over operating costs, without regard to any capital costs to drill or equip the well, or to deliver the oil or gas to market, and (ii) the Lessee shall be deemed to be conducting operations in search of oil or gas, or their constituents, if the Lessee is engaged in geophysical and other exploratory work including, but not limited to, activities to drill an initial well, to drill a new well, or to rework, stimulate, deepen, sidetrack, frac, plug back in the same or different formation or repair a well or equipment on the Leasehold or any lands pooled/unitized therewith (such activities shall include, but not be limited to, performing any preliminary or preparatory work necessary for drilling, conducting internal technical analysis to initiate and/or further develop a well, obtaining permits and approvals associated therewith and may include reasonable gaps in activities provided that there is a continuum of activities showing a good faith effort to develop a well or that the cessation or interruption of activities was beyond the control of Lessee, including interruptions caused by the acts of third parties over whom Lessee has no control or regulatory delays associated with any approval process required for conducting such activities).

(B) **LIMITATION OF FORFEITURE:** This Lease shall never be subject to a civil action or proceeding to enforce a claim of termination, cancellation, expiration or forfeiture due to any action or inaction by the Lessee, including, but not limited to making any prescribed payments authorized under the terms of this Lease, unless the Lessee has received written notice of Lessor's demand and thereafter fails or refuses to satisfy or provide justification responding to Lessor's demand within 60 days from the receipt of such notice. If Lessee timely responds to Lessor's demand, but in good faith disagrees with Lessor's position and sets forth the reasons therefore, such a response shall be deemed to satisfy this provision, this Lease shall continue in full force and effect and no further damages (or other claims for relief) will accrue in Lessor's favor during the pendency of the dispute, other than claims for payments that may be due under the terms of this Lease.

PAYMENTS TO LESSOR. In addition to the bonus paid by Lessee for the execution hereof, Lessee covenants to pay Lessor, proportionate to Lessor's percentage of ownership, as follows:

(A) **DELAY RENTAL:** To pay Lessor as Delay Rental, after the first year, at the rate of five dollars (\$5.00) per net acre per year payable in advance. **The parties hereto agree that this is a Paid-Up Lease with no further Delay Rental and/or Delay in Marketing payments due to Lessor during the primary term hereof.**

(B) **ROYALTY:** To pay Lessor as Royalty, less all taxes, assessments, and adjustments on production from the Leasehold, as follows:

1. OIL: To deliver to the credit of Lessor, free of cost, a Royalty of the equal one-eighth (1/8) part of all oil and any constituents thereof produced and marketed from the Leasehold.

2. GAS: To pay Lessor on actual volumes of gas sold from said land, one-eighth of the net amount realized by Lessee, computed at the wellhead. As used in this lease, the term "net amount realized by Lessee, computed at the wellhead" shall mean the gross proceeds received by Lessee from the sale of oil and gas minus post-production costs incurred by Lessee between the wellhead and the point of sale. As used in this Lease, the term "post-production costs" shall mean all costs and expenses of (a) treating and processing oil and/or gas, and (b) separating liquid hydrocarbons from gas, other than condensate separated at the well, and (c) transporting oil and/or gas, including but not limited to transportation between the wellhead and any production or treating facilities, and transportation to the point of sale, and (d) compressing gas for transportation and delivery purposes, and (e) metering oil and/or gas to determine the amount sold and/or the amount used by Lessee, and (f) sales charges, commissions and fees paid to third parties (whether or not affiliated) in connection with the sale of the gas, and (g) any and all other costs and expenses of any kind or nature incurred in regard to the gas, or the handling thereof, between the wellhead and the point of sale. Lessee may use its own pipelines and equipment to provide such treating, processing, separating, transportation, compression and metering services, or it may engage others to provide such services; and if Lessee uses its own pipelines and/or equipment, post-production costs shall include without limitation reasonable depreciation and amortization expenses relating to such facilities, together with Lessee's cost of capital and a reasonable return on its investment in such facilities. Prior to payment of royalty, Lessor may be required to execute a Division Order certifying Lessor's interest in production. Lessee may pay all taxes and fees levied upon the oil and gas as produced, including, without limitation, severance taxes and privilege and surveillance fees, and deduct a proportionate share of the amount so paid from any monies payable to Lessor hereunder. Lessee may withhold Royalty payment until such time as the total withheld exceeds fifty dollars (\$50.00).

(C) DELAY IN MARKETING: In the event that Lessee drills a well on the Leasehold or lands pooled/unitized therewith that is awaiting completion, or that Lessee deems to be capable of production, but does not market producible gas, oil, or their constituents, therefrom, and there is no other basis for extending this Lease, Lessee shall pay after the primary term and until such time as marketing is established (or Lessee surrenders the Lease) a Delay in Marketing payment equal in amount and frequency to the annual Delay Rental payment, and this Lease shall remain in full force and effect to the same extent as payment of Royalty.

(D) SHUT-IN: In the event that production of oil, gas, or their constituents, is interrupted and not marketed for a period of twelve (12) months, and there is no producing well on the Leasehold or lands pooled/unitized therewith, Lessee shall thereafter, as Royalty for constructive production, pay a Shut-in Royalty equal in amount and frequency to the annual Delay Rental payment until such time as production is re-established (or Lessee surrenders the Lease) and this Lease shall remain in full force and effect. During Shut-in, Lessee shall have the right to rework, stimulate, or deepen any well on the Leasehold or to drill a new well on the Leasehold in an effort to re-establish production, whether from an original producing formation or from a different formation. In the event that the production from the only producing well on the Leasehold is interrupted for a period of less than twelve (12) months, this Lease shall remain in full force and effect without payment of Royalty or Shut-in Royalty.

(E) DAMAGES: Lessee will remove unnecessary equipment and materials and reclaim all disturbed lands at the completion of activities, and Lessee agrees to repair any damaged improvements to the land and pay for the loss of growing crops or marketable timber.

(F) MANNER OF PAYMENT: Lessee shall make or tender all payments due hereunder by check, payable to Lessor, at Lessor's last known address, and Lessee may withhold any payment pending notification by Lessor of a change in address. Payment may be tendered by mail or any comparable method (e.g., Federal Express), and payment is deemed complete upon mailing or dispatch. Where the due date for any payment specified herein falls on a holiday, Saturday or Sunday, payment tendered (mailed or dispatched) on the next business day is timely.

(G) CHANGE IN LAND OWNERSHIP: Lessee shall not be bound by any change in the ownership of the Leasehold until furnished with such documentation as Lessee may reasonably require. Pending the receipt of documentation, Lessee may elect either to continue to make or withhold payments as if such a change had not occurred.

(H) TITLE: If Lessee receives evidence that Lessor does not have title to all or any part of the rights herein leased, Lessee may immediately withhold payments that would be otherwise due and payable hereunder to Lessor until the adverse claim is fully resolved.

(I) LIENS: Lessee may, at its option, pay and discharge any past due taxes, mortgages, judgments, or other liens and encumbrances on or against any land or interest included in the Leasehold; and Lessee shall be entitled to recover from the debtor, with legal interest and costs, by deduction from any future payments to Lessor or by any other lawful means. In the event the leased lands are encumbered by a prior mortgage, then, notwithstanding anything contained herein to the contrary, Lessee shall have the right to suspend the payment of any royalties due hereunder, without liability for interest, until such time as Lessor obtains at its own expense a subordination of the mortgage in a form acceptable to Lessee.

(J) CHARACTERIZATION OF PAYMENTS: Payments set forth herein are covenants, not special limitations, regardless of the manner in which these payments may be invoked. Any failure on the part of the Lessee to timely or otherwise properly tender payment can never result in an automatic termination, expiration, cancellation, or forfeiture of this Lease. Lessor recognizes and acknowledges that oil and gas lease payments, in the form of rental, bonus and royalty, can vary depending on multiple factors and that this Lease is the product of good faith negotiations. Lessor hereby agrees that the payment terms, as set forth herein, and any bonus payments paid to Lessor constitute full consideration for the Leasehold. Lessor further agrees that such payment terms and bonus payments are final and that Lessor will not seek to amend or modify the lease payments, or seek additional consideration based upon any differing terms which Lessee has or will negotiate with any other lessor/oil and gas owner.

(K) PAYMENT REDUCTIONS: If Lessor owns a lesser interest in the oil or gas than the entire undivided fee simple estate, then the rentals (except for Delay Rental payments as set forth above), royalties and shut-in royalties hereunder shall be paid to Lessor only in the proportion which Lessor's interest bears to the whole and undivided fee.

UNITIZATION AND POOLING. Lessor grants Lessee the right to pool, unitize, or combine all or parts of the Leasehold with other lands, whether contiguous or not contiguous, leased or unleased, whether owned by Lessee or by others, at a time before or after drilling to create drilling or production units either by contract right or pursuant to governmental authorization. Pooling or unitizing in one or more instances shall not exhaust Lessee's pooling and unitizing rights hereunder, and Lessee is granted the right to change the size, shape, and conditions of operation or payment of any unit created. Lessor agrees to accept and receive out of the production or the revenue realized from the production of such unit, such proportional share of the Royalty from each unit well as the number of Leasehold acres included in the unit bears to the total number of acres in the unit. Otherwise, as to any part of the unit, drilling, operations in preparation for drilling, production, or shut-in production from the unit, or payment of Royalty, Shut-in Royalty, Delay in Marketing payment or Delay Rental attributable to any part of the unit (including non-Leasehold land) shall have the same effect upon the terms of this Lease as if a well were located on, or the subject activity attributable to, the Leasehold. In the event of conflict or inconsistency between the Leasehold acres ascribed to the Lease, and the local property tax assessment calculation of the lands covered by the Lease, or the deeded acreage amount, Lessee may, at its option, rely on the latter as being determinative for the purposes of this paragraph.

FACILITIES. Lessee shall not drill a well on the Leasehold within 200 feet of any structure located on the Leasehold without Lessor's written consent. Lessor shall not erect any building or structure, or plant any trees within 200 feet of a well or within 25 feet of a pipeline without Lessee's written consent. Lessor shall not improve, modify, degrade, or restrict roads and facilities built by Lessee without Lessee's written consent.

CONVERSION TO STORAGE. Lessee is hereby granted the right to convert the Leasehold or lands pooled/unitized therewith to gas storage. At the time of conversion, Lessee shall pay Lessor's proportionate part for the estimated recoverable gas remaining in any well drilled pursuant to this Lease using methods of calculating gas reserves as are generally accepted by the natural gas industry and, in the event that all wells on the Leasehold and/or lands pooled/unitized therewith have permanently ceased production, Lessor shall be paid a Conversion to Storage payment in an amount equal to Delay Rental for as long thereafter as the Leasehold or lands pooled/unitized therewith is/are used for gas storage or for protection of gas storage; such Conversion to Storage payment shall first become due upon the next ensuing Delay Rental anniversary date. The use of any part of the Leasehold or lands pooled or unitized therewith for the underground storage of gas, or for the protection of stored gas will extend this Lease beyond the primary term as to all rights granted by this Lease, including but not limited to production rights, regardless of whether the production and storage rights are owned together or separately.

DISPOSAL AND INJECTION WELLS. Lessor hereby grants to Lessee the right to drill wells and/or re-enter existing wells, including necessary location, roadway and pipeline easements and rights of way, on any part of the Leasehold or lands pooled or unitized therewith for the disposal and/or injection into any subsurface strata, other than a potable water strata, of air, gas, brine, completion and production fluids, waste water and any hydrocarbon related substances from any source, including, but not limited to wells on the Leasehold or lands pooled or unitized therewith or from properties and lands outside the Leasehold or lands pooled or unitized therewith, and to conduct all operations as may be required, for so long as necessary and required by Lessee for purposes as herein provided. If, at the expiration of the primary term, Lessee is disposing and/or injecting into any subsurface strata underlying the Leasehold or lands pooled or unitized therewith or conducting operations for such disposal and/or injection and this lease is not being maintained by any other provision contained herein and no other payments are being made to Lessor as prescribed hereunder, Lessee shall pay to Lessor the sum of one thousand dollars (\$1,000.00) per year, proportionately reduced to Lessor's ownership in the Leasehold and surface as it bears to the full and undivided estate, beginning on the next anniversary date of this Lease and said payment and term of this Lease, insofar as to terms and provisions contained herein applicable to disposal and injection wells, shall continue annually thereafter for so long as necessary and required by Lessee for purposes as herein provided and until all disposal and/or injection wells located on the Leasehold or on lands pooled or unitized therewith are plugged and abandoned. Lessor agrees that if required by Lessee, regulatory agency or governmental authority having jurisdiction, Lessor shall enter a separate Disposal and Injection Agreement with Lessee for the purposes as herein provided.

TITLE AND INTERESTS. Lessor hereby warrants generally and agrees to defend title to the Leasehold and covenants that Lessee shall have quiet enjoyment hereunder and shall have benefit of the doctrine of after acquired title. Should any person having title to the Leasehold fail to execute this Lease, the Lease shall nevertheless be binding upon all persons who do execute it as Lessor.

LEASE DEVELOPMENT. There is no implied covenant to drill, prevent drainage, further develop or market production within the primary term or any extension of term of this Lease. There shall be no Leasehold forfeiture, termination, expiration or cancellation for failure to comply with said implied covenants. Provisions herein, including, but not limited to the prescribed payments, constitute full compensation for the privileges herein granted.

COVENANTS. This Lease and its expressed or implied covenants shall not be subject to termination, forfeiture of rights, or damages due to failure to comply with obligations if compliance is effectively prevented by federal, state, or local law, regulation, or decree, or the acts of God and/or third parties over whom Lessee has no control.

RIGHT OF FIRST REFUSAL. If at any time within the primary term of this lease or any continuation or extension thereof, Lessor receives any bona fide offer, acceptable to Lessor, to grant an additional Lease ("Top Lease") covering all or part of the Leasehold, Lessee shall have the continuing option by meeting any such offer to acquire a Top Lease on equivalent terms and conditions. Any offer must be in writing and must set forth the proposed Lessee's name, bonus consideration and royalty consideration to be paid for such Top Lease, and include a copy of the lease form to be utilized reflecting all pertinent and relevant terms and conditions of the Top Lease. Lessee shall have fifteen (15) days after receipt from Lessor of a complete copy of any such offer to advise Lessor in writing of its election to enter into an oil and gas lease with Lessor on equivalent terms and conditions. If Lessee fails to notify Lessor within the aforesaid fifteen (15) day period of its election to meet any such bona fide offer, Lessor shall have the right to accept said offer. Any Top Lease granted by Lessor in violation of this provision shall be null and void.

ARBITRATION. In the event of a disagreement between Lessor and Lessee concerning this Lease or the associated Order of Payment, performance thereunder, or damages caused by Lessee's operations, the resolution of all such disputes shall be determined by arbitration in accordance with the rules of the American Arbitration Association. Arbitration shall be the exclusive remedy and cover all disputes, including but not limited to, the formation, execution, validity and performance of the Lease and Order of Payment. All fees and costs associated with the arbitration shall be borne equally by Lessor and Lessee.

ENTIRE CONTRACT. The entire agreement between Lessor and Lessee is embodied herein and in the associated Order of Payment (if any). No oral warranties, representations, or promises have been made or relied upon by either party as an inducement to or modification of this Lease.

TITLE CURATIVE. Lessor agrees to execute affidavits, ratifications, amendments, permits and other instruments as may be necessary to carry out the purpose of this lease.

SURRENDER. Lessee, at any time, and from time to time, may surrender and cancel this Lease as to all or any part of the Leasehold by recording a Surrender of Lease and thereupon this Lease, and the rights and obligations of the parties hereunder, shall terminate as to the part so surrendered; provided, however, that upon each surrender as to any part of the Leasehold, Lessee shall have reasonable and convenient easements for then existing wells, pipelines, pole lines, roadways and other facilities on the lands surrendered.

SUCCESSORS. All rights, duties, and liabilities herein benefit and bind Lessor and Lessee and their heirs, successors, and assigns.

FORCE MAJEURE. All express or implied covenants of this Lease shall be subject to all applicable laws, rules, regulations and orders. When drilling, reworking, production or other operations hereunder, or Lessee's fulfillment of its obligations hereunder are prevented or delayed by such laws, rules, regulations or orders, or by inability to obtain necessary permits, equipment, services, material, water, electricity, fuel, access or easements, or by fire, flood, adverse weather conditions, war, sabotage, rebellion, insurrection, riot, strike or labor disputes, or by inability to obtain a satisfactory market for production or failure of purchasers or carriers to take or transport such production, or by any other cause not reasonably within Lessee's control, this Lease shall not terminate, in whole or in part, because of such prevention or delay, and, at Lessee's option, the period of such prevention or delay shall be added to the term hereof. Lessee shall not be liable in damages for breach of any express or implied covenants of this Lease for failure to comply therewith, if compliance is prevented by, or failure is the result of any applicable laws, rules, regulations or orders or operation of force majeure.


SEVERABILITY. This Lease is intended to comply with all applicable laws, rules, regulations, ordinances and governmental orders. If any provision of this Lease is held by a court of competent jurisdiction to be invalid, void, or unenforceable, the remaining provisions shall survive and continue in full force and effect to the maximum extent allowed by law. If a court of competent jurisdiction holds any provision of this Lease invalid, void, or unenforceable under applicable law, the court shall give the provision the greatest effect possible under the law and modify the provision so as to conform to applicable law if that can be done in a manner which does not frustrate the purpose of this Lease.

COUNTERPARTS. This Lease may be executed in one or more counterparts, each of which will be deemed to be an original copy of this Lease and all of which, when taken together, will be deemed to constitute one and the same agreement.

****See Confidential EXHIBIT A addendum attached hereto and by reference made a part hereof, but not recorded herewith****

IN WITNESS WHEREOF, Lessor hereunto sets hand and seal.

Witness _____


Brenda Smith, f/k/a Brenda Thomas (Seal)

ACKNOWLEDGMENT

STATE OF Ohio)
COUNTY OF Troum BULL) SS:

On this, the 26 day of July 2010, before me, a notary public, the undersigned authority, personally appeared **Brenda Smith, f/k/a Brenda Thomas, married and doing business in her sole and separate right**, known to me (or satisfactorily proven) to be the person(s) whose name(s) is/are subscribed to the within instrument, and acknowledged that he (she/they) executed the same for the purposes therein contained.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

My Commission Expires: Aug 24 2013

Signature/Notary Public: Marianne O'Malley

Name/Notary Public (print): Marianne O'Malley

MARIANNE O'MALLEY, NOTARY PUBLIC
STATE OF OHIO
MY COMMISSION EXPIRES AUGUST: 24, 2013

Recorder: Return to Chesapeake Appalachia, L.L.C., Land Dept., P.O. Box 18496, Oklahoma City, Oklahoma 73154-0496.

Jan Pest
MARSHALL County 01:57:25 PM
Instrument No 1295499
Date Recorded 11/23/2010
Document Type O&G
Pages Recorded 4
Book-Page 714-186
Recording Fee \$5.00
Additional \$6.00

STATE OF WEST VIRGINIA, MARSHALL COUNTY, SCT.:

I, JAN PEST, Clerk of the County Commission of said County, do hereby certify that the annexed writing, bearing date on the 17th day of July, 2010, was presented for and by me, admitted to record in my office upon the above certificate as to the parties therein named this 23rd day of December, 2010 at 1:57 o'clock P.M.

TESTE: Jan Pest

Clerk.